



By Virtue of His Majesty's
Royal LETTERS PATENT.

GRANTED UNTO

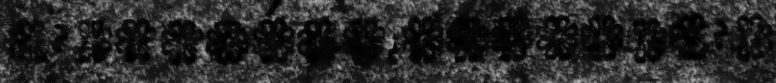
W. Bradford, R. Darby, & J. Halls

Of Campden in Gloucestershire,

For their new-invented

SLIDING RULE

1761



$$\begin{array}{r} 18 \\ 190 \\ 15 \\ \hline 270 \end{array}$$

A close-up photograph of a rough, textured surface, possibly a wall or concrete. The numbers '470' and '471' are visible, with '470' being more prominent and slightly larger than '471'. The texture is grainy and uneven.

1041



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Abstract of his MAJESTY'S ROYAL LETTERS PATENT. GEORGE R.

GEORGE the Second, by the Grace of God,
of Great-Britain, France and Ireland, King,
defender of the Faith, &c. To all and to
whom these presents shall come greeting.

WHEREAS W. BRADFORD,
R. DARBY. and J. HULLS, have
with much labour and study, Invented

A portable INSTRUMENT

For detecting FRAUDS by

COUNTERFEIT GOLD.

Which gives the Weight, and shews the Alloy,
as well in COIN as in all other UTENSILS
made with that METAL, with the quantity of
adulteration, in as little a time as GOLD is
weigh'd. And whereas they have also invented

A

A new SLIDING-RULE.

which performs the same at One operation as requires two or three on the Sliding Rules heretofore made. And as it hath been made appear, that the said INSTRUMENTS will be very useful to our loving Subjects, we have most graciously granted unto the said W. BRADFORD, R. DARBY, and J. HULLS, our Letters Patent under the great Seal of Great-Britain, for the sole use and benefit of the said Inventions, within England, Wales, and Town of Berwick upon Tweed, also within our Colonies and Plantations abroad. And we do, by these presents, for us, our Heirs and Successors, require and strictly Command all and every Person and Persons, Bodies Politic and Corporate, and all our Subjects whatsoever, of what State, quality, name condition, or degree soever they be, within that part of our Kingdom of Great Britain, call'd England, our dominion of Wales, and Town of Berwick upon Tweed, also within our Colonies and Plantations abroad, that neither they, nor any of them at any time during the Term of Fourteen Years hereby granted either directly or indirectly, do make or put in practice the said inventions, or any part of the same, nor in any wise counterfeit, imitate or resemble the same, or make any addition or subtraction to pretend themselves the Inventors, upon such pains and penalties as can or may be inflicted on such offenders for their contempt of this our Royal Command. In witness whereof we have caused these our Letters to be made Patent.

Witness ourself at Westminster, the
twenty-seventh Year of our Reign.

49.673 AD. 1761

The ART of
Second year of King George 3^d
MEASURING made EASY,

By the HELP of a NEW
SLIDING RULE,

W H I C H

Performs the same at ONE OPERATION,

As requires TWO or THREE or MORE,

On the Sliding-Rules here of one used,

IN A

Plain, easy, and concise METHOD, entirely new.

BY

W. BRADFORD,

R. DARBY, and

J. HULLS,

} PHILAMOTHE.

All of CAMDEN in GLOUCESTERSHIRE.

[Lithon Palace 412 626 of 1753.]
N. B. For the Curious the Authors have

SLIDING-RULES of a particular Make,

with BRASS-SLIDES, at 7s. each.

STRAFORD: Printed by J. KEATING, 1762.

ADVERTISEMENT

To be had of the A U T H O R S,
W. BRADFORD, R. DARBY, and J. HULLS
The MALT-MAKER'S INSTRUCTOR,
(*Never before Published,*)

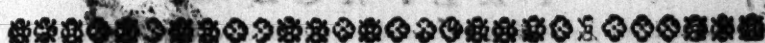
S H E W I N G,

How any person that can only Multiply may know the Duty to a Farthing (according to Act of Parliament) of any quantity of MALT, either in Cistern, Couch, or Floor, without any regard being had to the number of Bushels; perform'd by Multiplication only, in a speedy method entirely new. Also how to place the divisions on a common dimension Cane or Stick, so that any person wholly unacquainted with Numbers, or the Gauging Instruments, may in the tenth of a Minute, know the Duty to the parts of a Penny of any quantity of MALT contained in a Cistern, Frame, &c. without either Pen, Paper, or Rule, or in the least charging the Memory. To which is added, by way of Appendix. Instructions to a BREWER; shewing how he may prepare a STICK that will instantly tell, by inspection what the Duty comes to of any Liquor contained in any Vessel. Price One Shilling.

Of whom also may be had, Price 5 s.

Their newly invented INSTRUMENT for detecting Frauds by Counterfeit Gold; which gives the weight, and shews the Alloy, as well in Coin, as in all other utensils made with that Metal, with the quantity of Adulteration, (if any) in as little time as Gold is weighed.





P R E F A C E.

28. 4. 14.

THIS INSTRUMENT recommends itself to the world, were it only for the ease and celerity in the performance of every operation, not being subject to the inconveniences that attend the common sliding rules; therefore it must of consequence be acceptable to the young practitioner, or those who require dispatch.

As for instance; in measuring **TIMBER** or **STONE**: Let a piece of timber or block of stone, or any other solid, be never so unequally sided, and let the dimensions be given in any denominations, this instrument will give the content at one set or operation, without being at the trouble of finding mean proportionals, as you are compelled to do in other Sliding-Rules. And the making of two or three sets gives a great deal of trouble, and is liable to many mistakes by reason we are generally compelled to carry a mixed number in the head, in order to proceed in the next operation: but here we are free'd from that trouble and difficulty. And what further recommends it to the world, is the commodiousness thereof, and manner of use; for in other instruments you are obliged to state the question right to find the answer, but in this, if you state the question improperly, it will come right notwithstanding, which renders it advantageous and easy, to those that are unskill'd in arithmetick or common slides. An

An instance in **BRICK WORK**. — Let the length and height of a wall be given, and the number of bricks thick, this instrument will give the content of any wall in rods, and reduce it to the standard thickness at one operation: Also if the length and height of any wall be given, with the length and thickness of one brick, the Instrument will shew at one operation, the number of bricks it will take to build such a wall.

It is also of great use in framing of timber for building, shewing the length of all hyps, valleys, gutter-pieces, or king-pieces, &c. at any pitch assigned, not only in square buildings, but also in bevel roofs, which lengths cannot be found by any arithmetical proportions, or by any other sliding-rule, yet are shewn on this by inspection; and therefore not only of great use to the master builder but also to the common carpenter, who is unskill'd in the rules of arithmetic.

Here are also many advantages in measuring **SUPERFICIALS**, as well as **SOLIDS**, by this instrument. As for instance: — If the content of a whole stock of boards be required, by setting the instrument for the length and breadth of one board only, you have the content of any number of those boards, whatsoever. The slide being set for one board, the instrument is, in effect, a table of the contents of any number of boards, without moving any part of the instrument. If there are parts of a foot in one board, all the parts, as well as the feet, are summed together in the content of the whole stock, at the same operation.

in

P R E F A C E

vā

in like manner may the **GLAZIER** sum up the contents of any number of panes of glass at one set; or a **BLACKSMITH** the contents of several casements.

For **PAVING**.—Let the length and breadth of a floor, and the length and breadth of one brick, &c. be given, it shews at one operation, how many bricks &c. will pave such floor. This **INSTRUMENT** not only surpasses the common slides in those particulars, but also in many more of great consequence; but we shall only instance in the following, viz.

There are but few useful questions in business relating to the measuring of **SOLIDS** (except cylinders) that can be answered at one set of the sliding rules now in use; for we seldom meet with a piece of timber or stone to be measured that hath equal sides, therefore cannot be answered at one set on the common sliding-rules, unless there be a line fitted by the instrument-maker for one particular purpose; then the said rule is rendered useless in all other cases, and will not cast up any **SOLID** that is in any other form; or if the dimensions are given, or the content required, in any other denomination than what the rule was made for, it will not answer the question, But this instrument remedies all those inconveniences in the sliding-rules now in use; for if the dimensions be given or required in what denominations soever, or different denomination, it answers the question with the same speed and exactness, as if given or requir'd in any particular denomination.

There

There are a great many more SOLIDS that the sliding-rule will not cast up at one operation, which this instrument will with ease and speed, as triangular Prisms, Pyramids, elliptical Cones, Globes, &c. Also those whose bases are elliptical, or paralelograms, Rhombus, Rhomboides, Trapeziums, Polygons, and many other.

In fine,—This Instrument multiplies any three numbers together successively, and divides that product by any other number at one set of the slide, which comprehends all the most useful questions relating to measuring of SUPERFICIALS and SOLIDS. It also performs the compound or Double Rule of Three, containing five numbers given to find a sixth, which no other sliding-rule will perform at one operation.

The use of this instrument is so much easier learnt and understood than the sliding-rules now in use, that any person, unskill'd in arithmetic or sliding-rules may, with the directions given, be capable of giving the content of any timber, stone, brick-work, gauging, paving, tiling, plastering, painting, &c. in a more easy method than hath been hitherto used.

The Price of the R U L E is Five Shillings. But if any person hath already a Carpenter's COMMON SLIDING-RULE, and is not willing to be at that expence, may have the BRASS-FURNITURE added to it, to slide on or take off at pleasure, which makes it as compleat for all purposes as the RULE before mentioned, without taking any more room in the pocket, or in the least defacing or damaging the RULE. The price of the said Furniture is Two Shillings. A Book of Directions, Six-pence.

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The A R T of MEASURING made EASY.

The Description of the R U L E.

TH E R U L E consists of five lines, marked A, B, C, D, and E; the lines marked A, B, C, are placed as in other rules, and counted in like manner from the left hand toward the right. The line D, is an additional line to move only in rectifying the instrument for any particular purposes, which line D, is an inverted line of numbers, and therefore counted from the right hand toward the left.

To shew the several uses of the before-mentioned instrument, observe as followeth. — Suppose you wou'd find the number 53, on the line D, look the figure 5, and call it 50, as you may do on the lines A, B, and C. as occasion requires, and for 3, take the three small or subdivisions toward the left hand. — And so of any other number on the line D.

Note, The line D, is never to be moved but in rectifying the instrument; that is, setting it to its proper gauge point for particular purposes you want it for.

It is also to be observed, that the figure 1, or unity on any part of the rule or brass, may be called

called 1, 10, 100, or 1000, &c. so consequently if unity is called 10, number 2 will be 20, number 3 will be 30, &c.

Again If unity is called 100, number 2 will be 200, number 3 will be 300; and so of the rest.

In rectifying the instrument, you have no more to do but to place number 1 or 10 on the line D, to its proper divisor or gauge point on the rule, and proceed as shall be hereafter taught.

When 1 or 10 on the line D is rectified to its proper divisor, it is indifferent which radius or part of the slide or line you make use of, since all numbers on the lines may be called either units, tens, or hundreds, &c. as mentioned before.

[We hope no person will be offended at our familiar explanation of the lines of numbers, for that is intended only for the use of those who are wholly unacquainted with it: But as the rules may drop into persons hands that have no knowledge of the lines, this explanation is inserted for their instruction.]

The use of the line E will be shewn in its proper place. (See page 29.)

Note, There is another sort of rules, which may be made to any length required, without a joint, containing two slides, which performs all its operations exactly in the same manner as the joint rule before-mentioned, and lines placed on it, with this small difference only; the lines
D and

D and E on the brass furniture are placed on the opposite side of the brass to each other, whereas on this rule with two slides the lines D and E are both placed on one side, and separated by these marks ***, yet are to be used in the same manner as those on the brass for the joint-rule.

Before we give any example on the rule, observe, that when the content of any solid is required in a greater denomination than the dimensions are given, in that case the said dimensions are to be multiplied together, and divided by a fixed number, in order to answer the question.

Therefore a divisor may be plac'd by a mark on the rule, for any purpose whatsoever, either for English or foreign measures that are not mentioned in this treatise; and such divisor may be plac'd against either of the radiuses which will best admit the number 1 or 10 on the line D to be placed to.

In the next place, I shall give some examples of the application of those lines on the rule; and, first,

Of unequal sided Timber or Stone.

THE length of unequal-sided timber is most frequently taken in feet, and the breadth and depth in inches: When those dimensions are multiplied together, they are to be divided by 144, to give the content in solid feet: and to perform this by the rule, first place the end of the brass as at 10, to the said number 144 on the line C, where there is a point on the opposite part of the rule mark'd timber; and there

Let it always remain to measure unequal sided timber. The instrument being thus rectified, you have no more to do but to bring either of the three given dimensions on C to either of the other two on D, and against the other on A, you have the answer on B.

E X A M P L E I.

S U P P O S E a piece of timber be 22 feet long, 18 inches wide, and 13 thick, what is the content?

Your line D being placed for unequal sided timber, as is before taught, by setting 10 on D to 144 on C, mark'd timber, then bring 18 on C to 13 on D, then against 22 on A, you have 35 and 7-10ths of a foot on B, the content.

As you have, in these cases, always three numbers given, viz. length, breadth, and depth, it is equal which of those numbers you set first, second, or last, in case you set either two of the three on C and D, and look against the other on A, and you have the answer on B; therefore the question cannot be stated wrong, let which numbers or dimensions soever you make use of be first or last; for, as in the aforesaid question, if you set 13 and 22 together on C and D, then against 18 on A you have the same answer 35, 7 feet; and so alternately.

E X A M P L E II

L E T a piece of timber be 20 feet long, 16 inches wide, and 6 deep, what is the content.

Bring

Bring 16 on C to 6 on D, and against 20 on A you have 13 and 3 10ths, the content on B.

EXAMPLE III.

A Piece of Timber 22 feet long, 20 inches wide, and 15 thick?

If you bring 20 on C to 15 on D, then against 22 on A is 45,8 feet on B, the answer.

There are other advantages in measuring Timber by this Instrument; as, suppose you were to measure all the Timber for a whole Building, and you begin and end one sort first; bring the breadth on C to the thickness on D, then you need not move any part of the Instrument till you have summ'd up all the contents of the timber of that sort, be it ever so much; and all different lengths: Then it is but moving the slide once to another breadth and thickness, and call up all the next sort that is in the whole work, before you move any part of the Instrument, be the lengths ever so different.

I have given the more examples in those first instances proposed, by reason all Problems in the following Work are answered in the same manner.

OF ROUND-TIMBER.

ROUND Timber is most commonly measured by taking one fourth of the girth, and call it the square of the piece. Tho' it is well known

known this method is very erroneous, yet there is good reason to be given, why this Custom should prevail in Measuring rough Timber, or otherwise there should be more difference in the price between the rough and squared Timber, considering the great waste in squaring.

When a piece of Timber is work'd up in a round form for any purpose, it ought to be measured as a Cylinder; which method gives the true solid content.

I shall give an example of each method to be used as occasion shall require.

* * To Measure a round tree the customary way, the line D remains as before in square Timber.

E X A M P L E

IF a piece of round Timber is 36 feet long, and the girt 44 inches, then one fourth of the girt is 11 inches.—Set 11 on C to 11 on D, and against 36 on A you have 30,2 feet, the content on B. —Let the same Piece be measured as a Cylinder to give the true content. Move 1 to or on the brass, or line D, to the gauge point marked O, whose divisor is 1810; then bring 44 (the circumferences in inches) on C to the same number on D, and against the length of feet on A you have the true content on B, 38,48 feet —But if the Diameter is given in inches, and the length in feet, move the brass to 183 on C. mark'd Cylinder, and bring the diameter on C to the same number on D, and against the length of feet on A you have

have the content in feet on B. The diameter of the aforesaid piece is 14 inches; bring 14 on C to 14 on D, and against 36 (the length) on A you have the true content on B, viz. 38, 48 as before.



OF BLOCKS OF STONE.

IN measuring blocks of stone all the dimensions are commonly taken in inches; in that case your divisor is 1728. To answer those questions, bring the end of the brass to the mark at the word stone on the rule, which is against 1728 on C. — Then to measure a stone, or any other solid, by this divisor, as you have three dimensions, viz. length, breadth, and thickness, (all taken in inches) bring either of the two numbers together on C and D, and against the other number on A you have the content at one operation.

EXAMPLE

LET a block of stone, or any other solid, be 50 inches long, 30 wide, and 15 thick, the instrument being rectified, and as you have three numbers before you [50, 30, and 15] it matters not which of the three you begin with: Suppose you bring 30 on C to 15 on D, then against 50 on A, you have 13 feet, and something more on B. Or

If you bring 30 on C to 50 on D, then against 15 on A you have the same answer: and so on alternately.



OF BRICKWORK.

Brick-work is measured by the rod of 16 feet and a half long, therefore a square rod contains 272 feet and the 25th part of a foot. When a wall is a brick and a half, or three half-bricks thick, and is 272 superficial feet and one fourth of a foot, it is said to be a rod, standard-measure.

[N. B. The thickness of any brick wall is counted by the number of half-bricks.]

When a wall is more or less than three half-bricks thick, it is reduced to the standard-measure, as followeth.—Let it be required to give the content of a wall, and to reduce it to the standard-measure at one operation; bring the end of the hairs to the point at brick-work, whose divisor is 816 75 on C, and there let it remain for those purposes; then bring the length of the wall in feet on C to the height on D, and look against the number of half bricks the wall is in thickness on A, and you have the content, standard measure, at one operation.

EXAMPLE I

LET a wall to be measured be 50 feet long 30 feet high, one brick and half thick, What is the content?

To answer this question, bring 30 on C to 50 on D, and against 3, the number of half-bricks thick, on A you have the content 5 5, which is five rods and a half, statute measure. Now

Now you have not only the content of this wall at statute thickness, but also the content thereof at any thickness, at one and the same operation, without moving any part of the instrument: For look against 5 half bricks on A, and you have 9.2 rods, which shews that this wall is 9.2 rods statute measure, at two bricks and one half thick.

Again, Look against 4 half bricks on A, and you have 7.35 rods at 2 bricks thick, all at one set of the instrument: Or, look against any other thickness on A, and you have the content statute thickness, on B. [The instrument being thus set for any wall, is, in effect, as a table of the several contents of that wall at any thickness.]

EXAMPLE II.

LET a wall to be measured be 73 feet long and 24 high, and 3 bricks and one half thick, which is 7 half bricks, What is the content?

Bring 73 on C to 24 on D, and against 7 on A you have 15.1 rods, at statute measure.

To know how many BRICKS will build any wall, the dimensions being given with the length and thickness of one brick only, at one operation.

AS bricks are not of one size in different countries, therefore here must be a new gauge point found, if the bricks are of a different

rent size from the statute; which will be shewn hereafter. The gauge point for the statute bricks is, 1562; to rectify the instrument for the statute bricks, set the end of the brass to 1562; on C, marked S. B. and let it remain there for bricks of statute measure.

EXAMPLE I

IF a wall be 30 feet long, and 8 high, and 3 half-bricks thick, how many bricks will build that wall?

The instrument being rectified, bring 30 on C to 8 on D, and against 3 (the number of half-bricks thick) on A, you have the content, 4609. Again, Suppose a wall is 5 half-bricks thick? Look against 5 on A, and you have 7610 on B, the answer. And so of any other thickness at one operation.

EXAMPLE II

LET a wall be 30 feet long, and 20 high, 4 half-bricks thick, What is the content?

Bring 53 on C to 20 on D, or, which is the same, bring 20 on C to 53 on D, and against 4 [the number of half-bricks thick] on A you have the content, 27137 :

Then admit you are in a country where the bricks are 9 inches and a half long, and 2 inches and three quarters thick, how many bricks will build a wall that is 40 feet long, and 7 high, and 4 half-bricks thick?

To find this or any other gauge point for those purposes, at one operation [as in this example]

ample] to rectify the instrument, bring 133 on B to the length of this brick [9 inches and a half] on A, then bring 1 or 10 on D to 2 and 3 4ths on C, and your instrument is rectified to the proper gauge point, 18,14, for bricks of this size.——Then to find the number of bricks in this wall, bring 40 on C to 7 on D; and again 4 [the number of half-bricks] on A you have 6173, the content on B.



To find any Gauge Point by numbers, for Bricks of any Size.

MULTIPLY the length of the brick in inches into the thickness in inches, and add a competent number of cyphers, and divide that sum by 144, the quotient will be a decimal, shewing where to fix the line D; and when the line D is fixed to the quotient on C, it may remain there to answer all questions for this purpose relating to bricks of the same size.

[What proper allowance is necessary to be made for mortar or lime, must be added to the length and thickness of one brick, in making the gauge point.

Observe, That when a person is in any country where the bricks are different from the statute measure, and hath occasion to use a gauge point for a particular size, it will be proper to make a mark on his rule, for the more easy rectifying the instrument for the size he, at any time wants it for.

Some



Some EXAMPLES in GAUGING.

And first, of M A L T.

The method heretofore used to GAUGE MALT, is by an inverted line fix'd on the officer's rule, particularly adapted to the gauging of M A L T; therefore unity on the said line is fixed to 2150 against the line C; and when the number of bushels is found by the rule, the duty is known, by having recourse to a table for that purpose, which is called monying the charge: But this instrument shews at one operation what the duty comes to (according to act of parliament) of any quantity of malt, either in cistern, couch, or floor, without any regard being had to the number of bushels, by having the dimensions in inches given. Also, we shall shew how, by the instrument, to make a comparison, and to know where the charge will arise, either from the couch or floor.

*** When a quantity of malt is thrown out of the cistern any space of time not exceeding thirty hours, the allowance according to law is no more than 1 5th, or four bushels in 20; but when it hath exceeded thirty hours, it is gauged as a floor-gauge; that is, with the allowance of 10 in 20, or one half, and so to the kiln.

EXAM—

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(21)

EXAMPLE I.

IF a couch of malt be 86 inches long, 82 wide and 18 deep, what is the duty in shillings and parts?

To rectify the instrument for couch gauges, always set unity on D to 537 on C, and let it remain; then bring two of the three dimensions together on C and D, and against the other on A you have the number of shillings the duty comes to: As in this example; set 18 on C to 82 on D, and against 86 on A you have 23, and something above a half on B; therefore the duty comes to 23 s. 7d. and so of any other.

Then for a floor gauge you have no more to do but to place the line D to 86 on C, and suppose the aforesaid malt when in the floor is more advanced in bulk, the dimensions are as follow, viz. 194 long, 87 wide, and 11 deep, set the dimensions as before taught, bring 194 and 87 together on C and D, and against 11 on A you have 21,5 on B, which is 2s. 1d. less than the couch; therefore the charge ariseth from the couch.

The method of gauging by this instrument being so easy, it is needless to give examples of every particular part of the work, since all divisors are readily found on the lines, therefore I shall only mention one or two **GENERAL RULES**: For in rectifying the line D, always set unity on D to the proper divisor on C when even with A, and proceed as before taught in other cases. As, when you gauge a brewer's

cooler or back at one operation, 1 or 10 on the line D is placed to 282 [the divisor] on C; then proceed as in other problems, and you have the answer in ale gallons on B.

To gauge a BREWER'S Cooler, that is in an elliptical form, at one operation.

PLACE unity on D to the gauge points for circles, viz. 359, mark'd A. G. R. V. denoting ALE GALLONS in round vessels, then bring the conjugate diameter and the transverse together on C and D, and against the depth on A you have the content in ale gallons on B; and so of any other.

N. B. If any solid or vessel is to be measured or gauged, and is in a cylindrical form, the instrument is to be rectified to its proper divisor, then bring the diameter on C to the same number on D, and against the length on A is the content on B.



OF LAND MEASURE,

THIS instrument is useful to those who often set or take reaping, breast plowing, hoeing or any other work by the acre, and are unacquainted with surveying or measuring of land; for if the length and breadth of a piece of land be given in yards, this instrument gives the content

content in acres, and also sums up what money the work comes to, at any price whatsoever, all at one and the same operation.

To rectify the instrument for this purpose, when the dimensions are taken in yards, always bring 1 or 10 on the line D to 4840, mark'd L denoting LAND MEASURE, and let it remain always for this purpose; then bring the length and breadth together on C and D, and against 1 on A you have the number of acres on B; and also against the price per acre in shillings on A you have the sum of money in shillings it comes to on B.

EXAMPLE I.

LET a piece of land be 290 yards, long and 50 wide, how much does it come to reaping, at 5s. per acre?

The instrument being rectified, bring 290 and 50 together on C and D; and against 1 on A you have 3 acres very nearly on B; then look against 5 (the price in shillings per acre) on A, and you have almost 15s. on B; and so of any other price at the same operation.

To lay out a piece of Land in single Acres.

RECTIFY the instrument to land measure, whose divisor is 4840, if the dimensions are taken in yards; then let a piece of land be of any length, the breadth is found that makes an acre, without moving any part of the instrument. Look against any length on C and you have the breadth on D; or look against any length on D, and you have the breadth that makes an acre on C.

EXAMPLE II.

IF a piece of land be 250 yards long, look against 250 on either of the lines C or D, and you have 19 and 3-10ths, and that breadth will make an acre at the aforesaid length.

Again, If a piece of land be 95 yards long, look against 95, and you have 51; and so of any other without moving any part of the instrument.

N. B. If the dimensions are taken in chains and links, the lines C and D are to stand even; that is, unity on D to unity on C, then it is performed in the same manner as before.



A CATALOGUE of the Gauge Points used in the preceeding Work to rectify the Instrument for the purposes herein treated of.

[Note, Either unity or 10 on the line D, which can be most conveniently placed to the divisor is brought to the said number on C, when set even with A; and most of the useful gauge points are marked with proper letters, signifying the purpose they are to answer.

GENERAL RULES.

WHEN the length of a board, &c. is taken in feet, and the breadth in inches, the divisor is 12, marked boards.

When

When the length of a piece of timber or stone is given in feet, and the breadth and depth in inches, the divisor is 144, mark'd timber.

When the dimensions of any solid are given in inches, the divisor or gauge point is 1728, to bring it into feet mark'd stone.

When the diameter of a cylinder is given in inches, and the length in feet, the divisor is 183, mark'd cylinder.

When the circumference of a cylinder given in inches, and the length in feet, the divisor is 1810, mark'd O.

When the dimensions of a brick wall are taken in feet, with the number of half-bricks thick, in order to bring it into rods, the divisor is 816, mark'd brick-work.

To know what number of statute bricks will build any wall, the divisor or gauge point is 1562 mark'd S. B. denoting statute bricks.

The divisor for malt bushels, mark'd M B S V in square vessels, is 2150; the divisor for malt in round vessels, is 2738, mark'd M B R V.

Ale gallons in square vessels is 282, mark'd A G S V.

Ale gallons in round vessels, the divisor is 359, mark'd A G R V.

Wine gallons in square vessels is 231, mark'd W G S V.

Wine gallons in round vessels, the divisor is 294, mark'd W G R V.

When the dimensions of a couch of malt is given in inches, and the duty in shillings required, the divisor or gauge point is 537, mark'd C. denoting couch.

When a floor gauge is given in inches, and the duty in shillings required, the divisor is 86 mark'd F, denoting floor gauge.

For land measure, when the length and breadth is given in yards to find the content in acres, and also to sum up the money it comes to, the divisor is 4840, marked L denoting land measure.

In laying out of land in single acres, the brass is at the point aforesaid, viz. 4840.

When the length and breadth is given in chains and links all the lines are set even.

When the dimensions of any superfiicals or solids are given in the same denomination the content is requied in, there is no divisor; for in those cases the line D is set even with the lines A B C; that is, unity to unity.

Note, That when the lines D or E on the brass are at any time mentioned, it is to be understood the same as line D or E on the rule before-mentioned.

OF BOARD MEASURE,

TO give the content in feet of a whole stock of boards, by taking the dimensions of one board only, at one operation, and to rectify the instrument for that purpose, bring 1 on D to board on the instrument, whose divisor is 12 and let it remain there always for measuring boards &c. where the divisor is 12; then bring the breadth of one board in inches on C to the

length in feet on D, then against the number of boards on A you have the content of the whole stock on B,

EXAMPLE I.

IF a stock of boards (13 in the stock) are 15 inches wide, and 14 feet long, what is the content?

Bring 14 on C to 15 on D, then against 13 on A you have 228 on B, the content of the whole stock. Or, find any number of boards on A, and against it you have the content on B.

EXAMPLE II.

LET a stock of boards be 17 inches wide, and 9 feet long, what is the content at one operation, of 1, 2, 3, 4, 5, or 6 boards?

Bring 9 on C to 17 on D, then against any number of those boards on A you have the respective answer. Against 1 board on A you have 12 and 7-10ths, the content on B.

Again, Look against 2 boards on A, and you have 25,5 the content on C, and so of the rest. For,

Against Number	{ 1 }	on the line A you have	{ 12,7 }	on the line B
	{ 2 }		{ 25,5 }	
	{ 3 }		{ 38,2 }	
	{ 4 }		{ 51 }	
	{ 5 }		{ 63,7 }	
	{ 6 }		{ 76,5 }	

Therefore this instrument being set for the dimensions of any board, it is in effect, a table of answers for any number of those boards whatsoever.

In like manner may a GLAZIER sum up the content of any number of panes of glass at one set; or a BLACKSMITH the contents of several casements.

EXAMPLE

LET a pane of glass be 3 feet, or 36 inches high, and 19 inches wide, what is the content; — In this case your divisor is 144.

Your instrument being rectified, bring 19 on C to 36 on D, then against 1 on A you have 4.75 on B; against 2 Panes on A you have 9.5 on B; against 3 on A you have 14.25 on B; and against 4 on A you have 19 feet on B; and so of any other number of panes, without moving any part of the instrument.

If the lengths or heights had been taken in feet, and the breadth in inches, your divisor would be 12.



Some GENERAL OBSERVATIONS for the Use of young Practitioners, to be made on the Lines of Numbers marked A B C D.

AS sometimes 1 on the line is called 10 or 100, &c. (as is before hinted) again, sometimes 10 or 100 on the rule is called but 1, or 1.10th, &c. and the other numbers are reckoned according as number 1 is called; therefore in the use of our SLIDING-RULE it is equal if either 1 or 10 on the line D, is brought

brought to your divisor or gauge point you are going to make use of. Also, it is equal which radius or part of the slide you set to the line D, or which radius or part of the line A you seek your third number on, in order to find the answer on B. When a question is proposed, it is easily seen which radius is most conveniently brought to the number proposed, and also on which radius on the line A you look on to find your answer on B; for there is not any number will fall off the lines in using these rules.

Of Framing of Timber for Building.

IN this place we shall shew the use of the **RULE** in framing of **TIMBER** for building. — When the line mark'd E is applied to the lines of numbers marked A B C, it gives the length of all hyps, valleys, gutter-pieces, king-pieces, &c. at any pitch assign'd, not only in square Building, but also in bevel roofs which lengths are not found by any arithmetical proportion, yet are here shewn by inspection.

To rectify the instrument, place unity or 1 on E to 1 or 10 on the lines of numbers, and let it always remain there for those purposes.

If half the breadth of the building, and length of the rafter be given, to find the hyps at the common pitch.

Note, Half the breadth of the building is made use of in the following work, by reason half the breadth of the building, the rafter and height of the roof, compleat a rectangular plain triangle

triangle; and half the breadth of the building, the rafter, and hyp, make a rectangular plain triangle. also;

The common pitch is, if one half the breadth of the building be 10, the rafter is 15; therefore bring 10 on C to 15 on E, and against one half the breadth of any building on B, is the length of the hyp on A.

EXAMPLE I.

IF half the breadth of the building be 12, look against 12 on B, and you have 21,6, the hyp, on A. Or if the half breadth be 9, look against 9 on B, and you have 16,2 on A, the length of the hyp; and so of any other, without moving any part of the instrument.

[N. B. When the slide is at any time placed for those purposes, it answers to all buildings whatsoever of the same pitch, without moving any part of the instrument, let the breadth be never so different, at one and the same operation. But if the pitch be different from the common pitch, as suppose the proportion is as 10 to 18, which is above common pitch, you have no more to do but to move 10 on C to 18 on E, and against one half (the breadth) on B, you have the length of the hyps on A of any building, at such pitch, without moving the instrument.—If the building is the square pitch, which is under the common pitch, always bring 10 on C to 14,14 on E, and against one half [the breadth of any building] on B is the length of the hyps on A, at that pitch,—If one half

of the building at that pitch be 8, then against 8 on B is 13.8 on A; and so of any other.— If the proportion of the pitches be not given, it is instantly found by the lines A and B; thus, set one half of the breadth of the building on B to the length of the rafter on A, and against 10 on B is the proportion of the pitch on A].

EXAMPLE II.

L E T one half the breadth of the building be 8, and the rafter 11.2-10ths, set 8 on B to 11.2-10ths on A, and against 10 on B is 14 on A, the proportion of the pitch; then the pitch being known, proceed as before; that is, always bring 10 on C to the Pitch on E, as in this example is 14; and against one half (the breadth of any building) on B is the hyp on A; as against 8, the half breadth on B, is 13.7 on A, the hyp; and so of any other, without moving any part of the instrument.

GENERAL RULES,

W H E N half the breadth of the building, and the rafter is given, and the pitch unknown, to find the hyp always bring one half [the breadth] on B to the length of the rafter on A; and observe what number 10 on the slide stands against on A; then you have no more to do but to bring 10 on the slide to the same number on the line E, as it stood against on A; and against one half [the breadth of any building] on B you have the length of the hyp on A, Or, if the height of the roof, and half of the breadth

How to find out

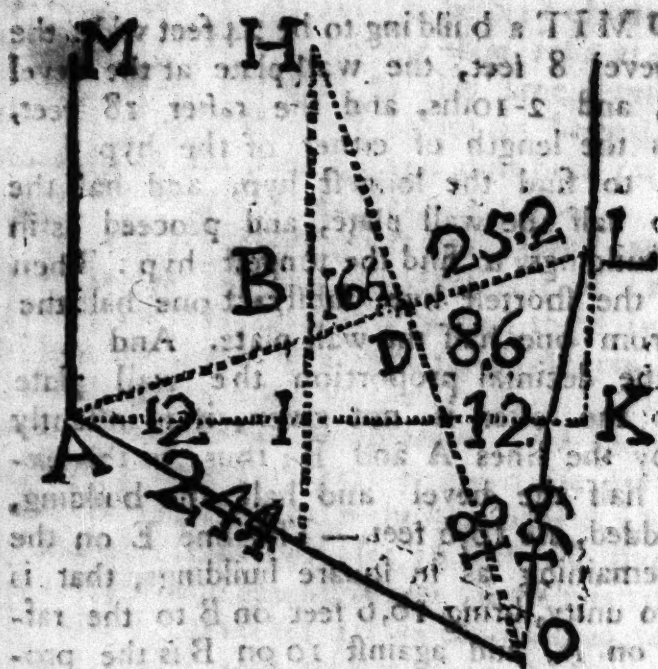
EXAMPLE

A DMIT a building to be 24 feet wide, the bevel 8 feet, the wall plate at the bevel end 25 and 2-10ths, and the rafter 18 feet, what is the length of either of the hyps?

First, to find the longest hyp, add half the bevel to half the wall plate, and proceed as in square buildings, to find the longest hyp: Then to find the shortest hyp, subtract one half the bevel from one half the wall plate. And

As the decimal proportion the wall plate bears to the rafter is not given, it is instantly found by the lines A and B; thus, in this example, half the bevel and half the building, when added, are 16,6 feet.—The line E on the brass remaining as in square buildings, that is unity to unity, bring 16,6 feet on B to the rafter 18 on A, and against 10 on B is the proportion that the part of the wall plate bears to the rafter, viz. 10,8 feet; then bring 1 on C to 10,8 on E and against 16,6, on B you have the length of the hyp on A, 24,4 feet.

Then to find the shortest hyp, subtract 4, the half of the bevel, from 12,6, the half of the wall plate and there remains 8,6; then as the proportion is not given, it may be found as before; set 8,6 on B to 18 on A, and against 10 on B you have 20,9, the proportional number the said part of the wall plate bears to the rafter; then to find the hyp, place 10 on C to 20,9 on E, and against 8,6 on B you have the length of the hyp on A, 19,9 feet; and so of any other.

The *DIAGRAM*.

EXPLANATION.

THE *DIAGRAM* (being a Geometrical CONSTRUCTION of the example in page 32) shews how to protract the dimensions of any square or bevel roof. Draw a line at pleasure, as *A I K*; at *I*, erect a perpendicular *I H*, then from a scale of equal parts, set off half the breadth of the building from *I* to *K*, and also from *I* to *A*, and erect a perpendicular at each end of the line *A K*; then set off the bevel from *K* to *L*, and draw the line *A L*; then set off one half the bevel from *B* to *D*, being the point where the rafter at this end intersects the

the wall-plate; then raise a perpendicular on the line AL at D , and prolong it 'till it intersects the line $I H$ at H , which represents the perpendicular point under the intersection of the rafter, ridge, and hyps; then prolong the line $H D$ equal to the length of the rafter from D to O .—A line drawn from A to O , and measured on the same scale, gives the length of the longest hyp, and a line drawn from L to O , and measur'd on the same scale gives the length of the shortest hyp.

In like manner may the lengths of the hyps, valleys, &c. be found in any building, be it either square or bevel.

28. 4. 14.



the wall-plate; then take a perpendicular line A B at D, and prolong it till it intersects the line I H at H, which represents the perpendicular point under the intersection of the latter ridge, and hence; then prolong the line D O equal to the length of the ridge from A to O, and draw a line from O, and perpendicular to the ridge, gives the length of the shortest hip.
In like manner, the length of the hips may be found in any building, be it square or oval.

78.4.14.



